

REMARKS

Claims 11-14 and 16-64 are pending, with claims 11, 18, 25, 32, 38, 47, 58, and 61 being independent. Claims 1-10 and 15 are cancelled, and Applicant preserves the right to pursue the subject matter of these claims in this or other related applications. Claims 11-14 and 23-25 are amended. New claims 54-64 are added by virtue of this amendment. No new matter has been added.

With regard to preliminary matters, the Office Action states on page 1 that Applicant's provisional application (No. 60/066,554) does not provide support for the various claim elements of claims 11-14, 16, 17, 21, 22, and 25-53. In response, and without agreeing with the relevant statement(s) within the Office Action, Applicant respectfully submits that the issue of whether Applicant's provisional application provides support for particular claim elements of Applicant's pending claims is, in this instance, not material to the prosecution of Applicant's claims. In particular, Applicant is not relying on the filing date of the provisional application to overcome any prior art of record (since no prior art has been cited in rejecting any of Applicant's claims).

Further, regarding the request to amend FIG. 4 to include the legend "Prior Art," Applicant respectfully submits that Applicant's reference to portions of FIG. 4 as "conventional" does not constitute a stipulation by Applicant that FIG. 4, or its description within Applicant's specification, constitutes prior art under 35 U.S.C. 102 or 103.

Claims 18-20 are allowed. Applicant thanks the Examiner for indicating the presence of allowable subject matter in these claims.

Claims 23 and 24, which depend from independent claim 18, are objected to for informalities. As the amendments to these claims are believed to correct the informalities, Applicant requests that the objections to these claims be withdrawn. Moreover, as these claims are not otherwise rejected, Applicant submits that the claims also are in condition for allowance.

Claims 11-17, 21, 22, and 25-53 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. In response, Applicant respectfully submits that these claims comply with 35 U.S.C. 112, first paragraph.

For example, amended claim 11 recites, in pertinent part, “a control system operable to modify the drive signal and thereby maintain oscillation of the flowtube during a time in which an apparent density of the fluid flow, as determined by the signal processing system based on the sensor signal characteristics, drops by more than ten percent in response to an introduction of gas within the fluid flow.”

Regarding this claim feature, the Office Action states that “the specification contains no support for using ten percent as the point to modify the drive signal.” In response, Applicant respectfully submits that the claim feature recites that the control system maintains oscillation of the flowtube in the presence of (at least) a ten percent density drop, and that this claim feature is clearly described within Applicant's specification.

For example, the specification repeatedly describes a feature of modifying a drive signal to maintain or otherwise control an oscillation of a flowtube. Further, the specification repeatedly describes an ability of the described flowmeter to operate in the presence of various density drops and/or levels. Some examples are page 2, lines 19-31; page 7, lines 7-15; page 68, line 20 to page 73, line 21, as well as FIG. 16, FIGS. 40A-40H, FIG. 42, and FIGS. 43A-43C.

In particular, FIG. 42 describes a control procedure for adjusting a sensor voltage setpoint and/or drive current, and thereby a drive gain, for the described flowmeter. That is, the drive gain refers, for example, to the relation of the drive current to the sensor voltage (i.e., the amplitude of oscillation), as recited in dependent claims 16 and 17. FIGS. 40A-40H illustrate operation of the described flowmeter at various density levels, and illustrate density drops of over 35 % (including an illustration of a “stall point” for a conventional flowmeter, as shown by the vertical dotted line at ~2% density drop in FIGS. 40A-40H). FIGS. 43A-43B illustrate examples of adjusting a drive gain for a flowmeter, in accordance with the description of FIG. 42, in which drops in density (FIG. 43A) correspond to drive gain adjustments (FIGS. 43B and 43C).

Therefore, Applicant respectfully submits that Applicant's specification describes the maintaining of an oscillation of a flowtube (by adjusting a drive gain) in the presence of a ten percent density drop (as well as in the presence of a fifteen or twenty percent density drop, as

recited in dependent claims 12 and 13, and illustrated in at least FIGS. 40A-40H). The portions of Applicant's specification referred to above further describe that the adjusting of the drive gain may be in response to, or based on, such a density drop(s), as generally recited in dependent claim 14 (which does not require that the particular density drops recited in claims 11-13 be used as trigger points for adjusting the drive gain, as appears to be maintained in the present Office Action).

As referred to above, independent claim 18 is allowed, along with dependent claims 19, 20, 23, and 24. However, as also referred to above, dependent claims 21 and 22 are rejected under 35, U.S.C. 112, first paragraph for lack of written description. In response, Applicant submits that these claims comply with 35 U.S.C. 112, first paragraph.

For example, claim 21 recites, "wherein the second-state drive gain is more than twenty times the first-state drive gain." Applicant notes that dependent claim 20, which recites a second-state drive gain that is more than ten times the first-state drive gain, has been allowed. Further, the recited drive gains are described and illustrated within Applicant's specification.

For example, referring to the passages and figures cited above, Applicant notes that page 69, lines 21-28 describes a situation in which driver gain may be adjusted to maintain oscillation. Pages 71-72 describe a procedure for adjusting a drive gain by adjusting a voltage set-point and/or a drive current. Page 73, lines 4-21 describe FIGS. 43A-43C, and describe and illustrate drive gain increases of at least a factor of twenty.

For example, FIG. 43A shows an example of increasing aeration (and thereby decreasing density) of a fluid in a flowtube. The lowest illustrated drive gain occurs at approximately time $t \sim 60$ s, at which a drive current of approximately 10mA is matched with a default set-point voltage of .3V, giving a drive gain of $\sim .03$. At time $t = 20$, drive current in the range of 150mA is matched with a sensor voltage of $\sim .25$ V, giving a drive gain of $\sim .6$, which is twenty times greater than .03. Moreover, these ranges are merely some examples of the range of operation of the described flowmeter. In particular, FIG. 43A shows a density drop of approximately 990 kg/m³ to 983 kg/m³, whereas, as already discussed, FIGS. 40A-40H illustrate considerably larger density drops, in which cases the drive gain could be increased beyond the particular example of

FIGS. 43A-43C. Still further, the default sensor voltage value of .3V is described merely as an example for a default value, and other, lower sensor voltages are described. For example, page 65, lines 11-15 describe voltage setpoints of .05 - .3.

Claim 22 has been amended to recite, that “ the determining the flow transition occurs during a reduction in apparent density of greater than ten percent,” and support for this limitation has been described above with respect to claims 11-13. Therefore, Applicant respectfully submits that claims 21 and 22 are compliant with 35 U.S.C. 112, first paragraph, and in condition for allowance.

With respect to claims 25-53, Applicant again submits that these claims are fully compliant with 35 U.S.C. 112, first paragraph. In particular, Applicant submits that Applicant's specification repeatedly describes the performance of measurements of parameter values at once or twice per cycle of the received sensor signals. For example, page 18, line 25 to page 19, line 6, as well as page 20, lines 1-12, describe that frequency, phase, and amplitude values are calculated once per cycle or twice per cycle (e.g., by overlapping half-cycles). FIGS. 20A-20C, as described at page 43, line 25 to page 44, line 3, show phase calculations every cycle or every half cycle. Page 52, lines 4-20 also describe measurements at every cycle or half-cycle. FIG. 6 illustrates that frequency, amplitude, phase, drive signal, and measurements may be performed together at cycle or half-cycle intervals. Page 71, lines 27-31, referring to FIG. 42, states that a setpoint adjustment and/or drive current (and thereby drive gain) selection is made once per cycle or once per half cycle. Further, typical flowmeter operating frequency ranges are described in the range of, for example, 65-95Hz (see, for example, page 30, lines 17-25), and a typical operating frequency may be, for example, ~82Hz (see, for example, page 67, lines 4-11), and these frequency ranges correspond to ~ 10ms – 15ms, or 12ms at 82 Hz.

Dependent claim 30 recites “...wherein the drive gain update rate is at least equal to the drive frequency,” which, as just mentioned, is supported, for example, by the procedure of FIG. 42 (“...the procedure is performed each time a desired drive current output is selected, which typically is once per cycle, or once every half-cycle...each time the procedure is performed, the

controller updates the filtered values based on current values...,” page 71, line 27 to page 72, line 6.

Since description is thus provided for drive gain updates occurring at least once per cycle (or more), Applicant submits that descriptions is thereby provided for the limitation of independent claim 25 that “wherein the drive gain update rate is at least five percent of the drive frequency.” Similar comments apply to dependent claims 26-29.

Similarly, dependent claim 37 recites that “...the drive gain incrementally changes at least once per cycle of the oscillation frequency.” This limitation is described by, for example, the above-quoted passages, which describe the updating procedure of FIG. 42 as occurring once per cycle or twice per cycle. Therefore, the limitation of independent claim 32 that, “the drive gain incrementally changes at least once per forty cycles of the oscillation frequency” is also described by at least the same passages.

Similar comments apply to claims 38-53, since, as already described, measurement outputs of the described flowmeter may be updated with the frequency, phase, and amplitude values at (at least) once per cycle (e.g., see FIG. 6). With respect to claims 47-49, Applicant notes again that described examples of time periods corresponding to cited frequency ranges are in the range of 10-15 ms, which is less than the 30-100 ms ranges cited in claims 47-49.

With respect to new claims 58-64, Applicant respectfully submits that support for these claims may be found, for example, at page 53, lines 13-16, as well as at page 64, lines 19 to 28, which refer to and describe FIGS. 36A-36L. Further support may be found, for example, at page 73, line 24 to page 74, line 13, as well as at page 79, lines 7-18. These passages and figures refer, for example, to an ability of the described flowmeter to maintain an oscillation of an associated flowtube when (substantially) empty, and/or when (substantially) filled or partially-filled with fluid. The passages and figures further describe and illustrate transitions of the flowmeter between empty, partially filled, and filled, including for example, “batching from empty” transitions in which separate batches of material are processed through a flowtube, and the flowtube is substantially empty before or between the batches. Applicant further submits that the ability of Applicant’s described flowmeter(s) to operate in states ranging from empty to full,

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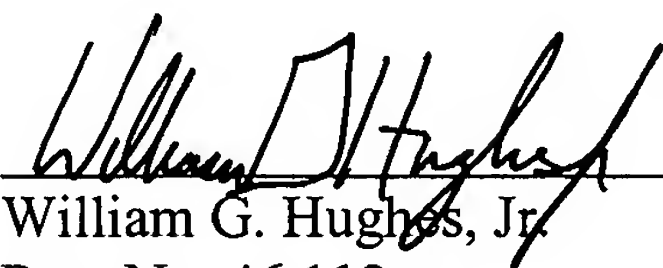
and for a variety of liquids and gasses, provides further support and description for Applicant's claimed operational ranges with respect to the density (drops), volumetric flow rate, and/or percent aeration of a given fluid flow.

Based on the above, all claims are believed to be in condition for allowance, and such action is hereby requested in the Examiner's next official communication.

Enclosed is a check for excess claim fees and for the Petition for Extension of Time fee in the amount of \$536.00. Please apply any other charges or credits to deposit account 06-1050.

Respectfully submitted,

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